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Applications of THz Wave

- Terahertz modulation and switching
- Chemical, biochemical, and astrobiological detection and sensing
- Materials and security Inspection
- High bandwidth, energy efficient, secure data link
- ..., many more applications

Introduction: Whys

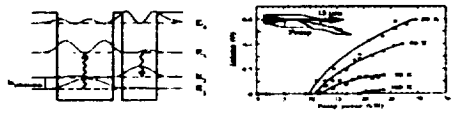
- Why Intersubband?
  - Long wavelength generation
  - Diminished Auger processes
  - Large transition matrix elements
- Why Sb-QWs?(unique bandedge lineups)
  - Flexibility in wavelength design
  - Deep conduction band wells allowing NIR (diode) laser pumping

Introduction: Whys

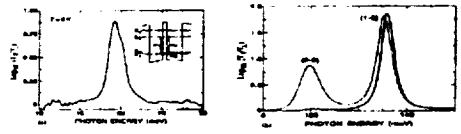
- Why optical pumping?
  - Less reliant on population inversion
  - Utilization of resonant nonlinearities
  - Lower carrier concentration and lower free carrier absorption
  - Absence of heavily doped layers for contacts and injectors
  - Potential integration if diode lasers used as pumping

Introduction: Present Approach

- CO_2 laser pumped GaAs/AlGaAs QWs emitting 15.5mm (Paris-Sud)

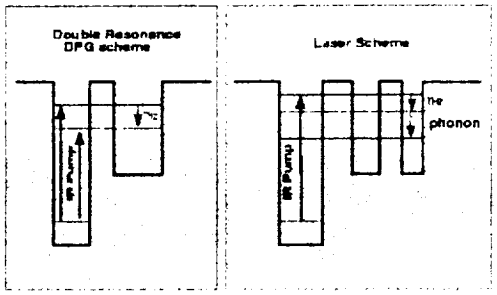


- FIR Generation by Double-Resonant DFG (Lucent)

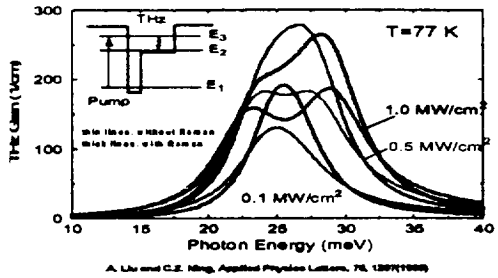


Proposed Solution:

Diode Laser Pumped QW-Intersubband Based THz Sources

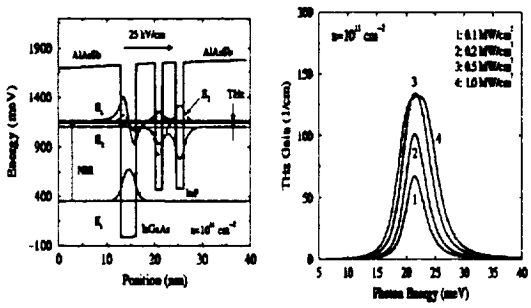


Raman Enhanced Optical Gain

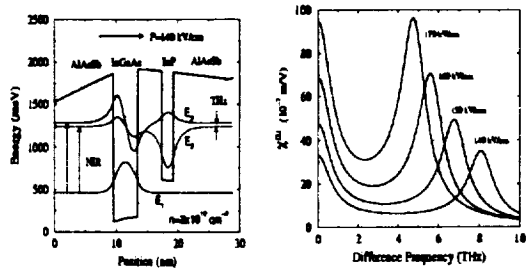


A. Liu and C.Z. Ning, Applied Physics Letters, 75, 1307(1999)

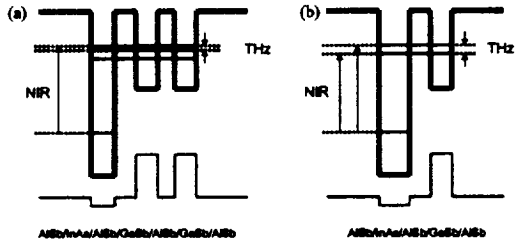
THz Laser Gain in InGaAs/InP/AlAsSb Quantum Wells



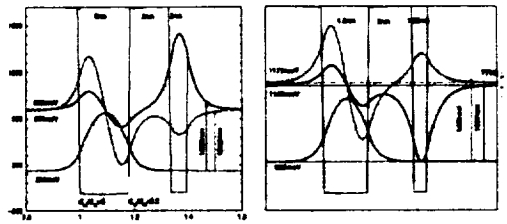
Diode-Laser Pumped Difference Frequency Generation (InGaAs/InP/AlAsSb QWs)



InAs/GaSb/AlSb Quantum Wells



InAs/AlSb Double QWS: DFG Scheme



InAs/AlSb Triple QWs: Laser Scheme